which are joined via a nonsuperconducting solder material. The shapes of the ends of the two high temperature superconducting components are adapted to minimize strain concentration in the wire.

Rejections under 35 U.S.C. § 112

Claims 1-15 stand rejected under 35 U.S.C. § 112, ¶1. This rejection is respectfully traversed for the reasons set forth below.

With respect to the Office Action's comments on claims 1 and 5, Applicants submit that the inventive concept disclosed and claimed in the present invention resides largely in the realization that the shape of the ends of individual superconducting filaments can be manipulated in order to minimize strain concentrations in a cable. The details of what type of end shape will be most effective in any particular application can easily be found by one of ordinary skill in the art (for example, by analytical or finite element modeling methods) without undue experimentation. Further, the specification gives substantial guidance to one of ordinary skill in the art as to how to go about selecting an end shape and overlap distance. A number of particular end geometries are shown, and advice as to the details of how to select a shape and overlap distance is given in the paragraph spanning pages 9-10. Thus, Applicant submits that the specification discloses sufficient information to enable one of ordinary skill in the art to make and use the invention without undue experimentation, and would reasonably convey to one skilled in the relevant art that the inventors were in possession of the claimed invention when the application was filed.

With respect to the Office Action's comments regarding claim 4, Applicant submits that "helicity" is a well-understood term in the cabling arts. One of ordinary skill in the art would clearly understand that a pair of wires wrapped with "opposite helicity" is intended to describe two wires wrapped in a right-handed and a left-handed helix, respectively.

For the reasons set forth above, it is believed that the claims are supported by adequate written description and are enabling to one of ordinary skill in the art. Reconsideration and withdrawal of all rejections under 35 U.S.C. § 112 is respectfully requested.

Rejections under 35 U.S.C. § 103

Claims 1-15 stand rejected under 35 U.S.C. § 103 as obvious over Schaetti in view of Kimura. Applicant submits that, as amended, these claims clearly distinguish over the cited references for the reasons set forth below.

Claim 1 has been amended with this response to specify that the solder material is nonsuperconducting. This amendment finds support, for example, in the disclosure that appropriate solders include lead-tin based solders, as described in the third full paragraph of page 7. Schaetti does not describe a solder at all, while Kimura discloses only a superconducting "solder". Applicant submits that one of ordinary skill in the art would not attempt to join superconducting components using a nonsuperconducting material on the basis of these references. For at least this reason, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Double patenting rejections

It is not clear from the Office Action whether the pending claims have actually been rejected for double patenting over Buczek. To the extent that such a rejection is levied, Applicant offers the following remarks.

A superconducting cable is typically a complex structure requiring many features to be taken into consideration for its effective construction. Buczek teaches to overlap two high temperature superconducting components to form a joint. However, without more, one of ordinary skill in the art might expect such an overlapping to cause significant problems in the construction of a superconducting cable.

The overlap segment may represent a relatively weak point in a superconducting component. Further, the overlap segment might be expected to make it difficult for the superconducting component to obtain adequate mechanical support and cooling from the core member about which it is wound, and might also make the component more vulnerable to thermal cycling effects.

For these reasons, one of ordinary skill in the art would not necessarily have any reasonable expectation of success when incorporating a joint as described in Buczek into a

superconducting cable. Thus, the currently pending claims cannot be considered obvious in view of the claims of Buczek. To the extent that the present claims have been rejected for obviousness-type double patenting, it is respectfully requested that this rejection be withdrawn.

Formal objections

The drawings have been objected to because they contain reference numerals not described in the specification. The specification has been amended to incorporate explicitly two paragraphs from European Patent No. 0 786 783, which was incorporated by reference into the instant application (see page 11, second full paragraph). These paragraphs, found at page 4, lines 46-52 of the '783 patent, describe the same drawing shown as Figure 4 of the present application. It is therefore requested that this objection be withdrawn.

The drawings have also been objected to as containing improper cross-hatching. Applicant submits that the guidelines of the MPEP describing cross-hatching to indicate material are advisory in nature, rather than mandatory, and that the present drawings clearly convey to one of ordinary skill in the art the articles that they illustrate. Withdrawal of this objection is therefore respectfully requested.

The abstract has been objected to as being more oriented to the method of making the invention. An amended abstract has been provided with this response. Withdrawal of this objection is therefore respectfully requested.

The disclosure has been objected to as being more oriented to the method of making the invention. Applicant is unaware of any statute or rule that would require the focus of the specification to be changed. In fact, it is required by 35 U.S.C. § 112 that the specification contain a written description of the *manner of making the invention*. Withdrawal of this rejection is therefore respectfully requested.

Claim 5 has been objected to for lacking the word "the" in line 4. This informality has been corrected with this response. Withdrawal of the objection is therefore respectfully requested.

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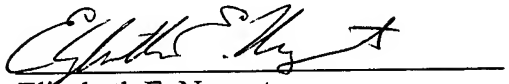
Respectfully submitted,



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APPENDIX A

Version with Markings to Show Changes Made

In the abstract:

A [method for joining] high temperature superconducting [components] joint for use in a superconducting cable while minimizing critical current degradation is provided. The [articles formed have] joint has a critical current[s] that [are] is at least 80% of the critical current of the high temperature superconducting components. The invention further provides splicing geometries that facilitate helically or otherwise bundling wires into cables with minimal critical current degradation and without kinking or flexion of the joined components.

In the specification, before the first full paragraph of page 13:

The cryostat **40** shown comprises a layer **41** of insulating material, formed, for instance, by several surface-metallized tapes (some tens) made of plastics (for instance, a polyester resin), known in the art as "thermal superinsulator," loosely wound, with the possible help of interposed spacers **43**. Such tapes are housed in an annular hollow space **42**, delimited by a tubular element **44**, in which a vacuum in the order of 10^{-2} N/m^2 is maintained by means of known apparatuses.

The tubular element **44** made of metal is capable of providing the annular hollow space **42** with the desired fluid-tight characteristics, and is covered by an external sheath **45**, for instance made of polyethylene.

In the claims:

1. A superconducting cable, comprising:

(a) a core member; and

(b) a first high temperature superconducting wire wrapped helically around the core member, where the first high temperature superconducting wire comprises

(i) a first high temperature superconducting component having a first end and a second end;

(ii) a layer of a first nonsuperconducting solder material, a portion of the solder layer attached to at least a portion of the first end of first high temperature superconducting component; and

(iii) a second high temperature superconducting component having a first end and a second end, at least a portion of the first end of the second high temperature superconducting component attached to a portion of the solder layer,

wherein the portion of the first high temperature superconducting component attached to the solder material and the portion of the second high temperature superconducting component attached to the solder material form an overlap segment;

wherein the shape of the first end of at least one of the first and second high temperature superconducting components is adapted to minimize strain concentration of said wires.

5. The cable of claim 1, wherein the first high temperature superconducting wire is wrapped around the core with a constant pitch, and the shape of the first ends of the first and second high temperature superconducting components are adapted to minimize strain concentrations in the first high temperature superconducting wire.